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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/770,797	02/03/2004	Donald L. Yates	150.00840102	1476
26813	7590	06/23/2006	EXAMINER	
MUETING, RAASCH & GEBHARDT, P.A. P.O. BOX 581415 MINNEAPOLIS, MN 55458			WEBB, GREGORY E	
			ART UNIT	PAPER NUMBER

1751

DATE MAILED: 06/23/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/770,797

Applicant(s)

YATES ET AL.

Examiner

Gregory E. Webb

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 07 May 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 26-50 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 26-50 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. _____  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                                    |

*6/19/06*

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

Claims 26-50 rejected under 35 U.S.C. 102(e) as being anticipated PETERS, DARRYL W. (US20030148910).

Concerning the organic solvent, PETERS, DARRYL W. teaches the following:

[0003] The present invention relates to low surface tension, low viscosity, aqueous, acidic compositions containing fluoride and organic, polar solvents for removal of photoresist and organic and inorganic etch or ash residues and processes for removal of photoresist and etch or ash residues. More particularly,

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the invention relates to a composition which is buffered having a pH value of between about 3 and about 6 and its use in removing photoresist and etch residue in processes operated at room temperature or above. The compositions of the present invention are free of **glycols** in general and in particular alkylene **glycols** and polyoxyalkylene **glycols**. (*emphasis added*)

Concerning the quaternary ammonium fluoride, fluoride ion source and the ammonium hydrogen fluoride, PETERS, DARRYL W. teaches the following:

[0012] Fluoride is an essential component of the composition of the present invention. Fluoride containing compositions include those of the general formula  $R_{sub.1}R_{sub.2}R_{sub.3}R_{sub.4}NF$  where  $R_{sub.1}$ ,  $R_{sub.2}$ ,  $R_{sub.3}$ , and  $R_{sub.4}$  are independently hydrogen, an alcohol group, an alkoxy group, an alkyl group or mixtures thereof. Examples of such compositions are ammonium **fluoride**, tetramethyl ammonium **fluoride**, tetraethyl ammonium **fluoride**. Fluoroboric acid can also be used as the **fluoride** composition. The **fluoride** is preferably present in amounts of from 0.1% by weight to 20% by weight. Ammonium **fluoride** is preferred. Ammonium **fluoride** is available commercially as a 40% aqueous solution. (*emphasis added*)

Concerning the semiconductor, PETERS, DARRYL W. teaches the following:

[0004] In the manufacture of **semiconductors** and **semiconductor** microcircuits, it is frequently necessary to coat substrate materials with a polymeric organic substance. Examples of some substrate materials includes, aluminum, titanium, copper, silicon dioxide coated silicon **wafer**, optionally having metallic elements of aluminum, titanium, or copper, and the like. Typically, the polymeric organic substance is a photoresist material. This is a material which will form an etch mask upon development after exposure to light. In subsequent processing steps, this polymeric organic substance (photoresist) must be removed from the surface of the substrate. One common method of removing photoresist from a substrate is by wet chemical means. The wet chemical compositions formulated to remove the photoresist from the substrate must do so without corroding, dissolving, or dulling the surface of any metallic circuitry; chemically altering the inorganic substrate; or attacking the substrate itself. Another method of removing photoresist is by a dry ash method where the photoresist is removed by plasma ashing using either oxygen or forming gas (hydrogen). In many instances the plasma ash method leaves residues or by-products. The residues or by-products may be the photoresist itself or a combination of the photoresist, underlying substrate and etch gasses. These residues or by-products are often referred to as sidewall polymers, veils or fences. (*emphasis added*)

Concerning the etch residues, PETERS, DARRYL W. teaches the following:

[0025] The formulation of example 1 was used to remove novolak photoresist and **etch residues** from an etched via pattern. The etched via was immersed in a bath equilibrated at 20.degree. C. containing the composition of example 1. Immersion time was 15 minutes. The etched via pattern was subsequently washed with

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deionized water and dried under nitrogen. The photoresist and **etch residue** were removed without measurably altering the via size. (*emphasis added*)

Claims 26-50 rejected under 35 U.S.C. 102(e) as being anticipated by Fine, Stephen A. (US20020043644).

Concerning the solvent, Fine teaches various solvents including glycols, amines (see abstract).

Concerning the quaternary ammonium fluoride, fluoride ion source and the ammonium hydrogen fluoride, Fine, Stephen A. teaches the following:

8. A formulation as described in claim 1 wherein said **fluoride** salt is selected from the group consisting of: Ammonium **fluoride**  
Pentamethyldiethylenetriammonium tri**fluoride** Tetramethylammonium **fluoride**  
Triethanolammonium **fluoride** (*emphasis added*)

Concerning the semiconductor, Fine, Stephen A. teaches the following:

[0002] Several different types of silicon oxide are utilized in the fabrication of **semiconductor** devices. Two of the most common types are referred to as "thermal oxide" and "BPSG." Thermal oxide is typically composed of pure silicon dioxide and is utilized when an insulating layer is required. For example, thin "gate" layers of thermal silicon oxide are often utilized to separate conducting layers from each other. Thermal oxide layers on **semiconductor wafers** are usually prepared by high temperature oxidation of surface silicon on a polysilicon **wafer**. BPSG layers are comprised of silicon oxide which has been doped with boron and phosphorus. These layers serve the purpose of "gettering" alkali metal ion contaminants which could otherwise migrate into underlying layers and adversely affect electrical properties of the layer materials, causing device reliability degradation. BPSG layers are typically created by deposition of a suitable precursor material via atmospheric chemical vapor deposition ("CVD") followed by thermal treatment to densify and planarize the layer. PSG layers serve the same gettering functions as BPSG layers but lack boron. (*emphasis added*)

Claims 26-50 rejected under 35 U.S.C. 102(e) as being anticipated by Bernhard, David (US6755989).

Concerning the organic solvent, fluoride ion source and the 2-amino-2-ethoxy ethanol, Bernhard, David teaches the following:

Formulations that have been found to be effective in cleaning residue and slurry particles from metal surfaces typically have pH values between about 7 and about 9. These formulations generally are aqueous solutions that comprise a **fluoride**

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source, an organic amine, and metal chelating agent. The individual constituents typically constitute a **fluoride** source and/or a derivative thereof as about 0.1 to about 4.2% of the formulation. The **fluoride** source may include Ammonium Fluoride, Triethanolammonium Fluoride (TEAF), Diglycolammonium Fluoride (DGAF), Tetramethylammonium Fluoride (TMAF), Ammonium Bifluoride or other such **fluoride** sources as known to those skilled in the art. The organic Amine or mixture of two amines typically comprises between about 2% and about 11% of the formulation of the present invention, wherein the organic amine can be one of many such organic amines known to those skilled in the art including Methyldiethanolamine, Pentamethyldiethylenediamine (PMDETA), **Triethanolamine (TEA), Monoethanolamine, and Diglycolamine**. The metal chelating agent or mixture of chelating agents typically comprises about 0 to about 4.2% of the formulation. Typical metal chelating agent include: iminodiacetic acid, 2,4-pentanedione, methyldiethanolammonium trifluoroacetate, ammonium carbamate, ammonium pyrrolidinedithiocarbamate, ammonium lactate, malonic acid or other similar agents as known to those skilled in the art. (*emphasis added*)

Concerning the quaternary ammonium fluoride, Bernhard, David teaches the following:

**tetramethylammonium fluoride (TMAF)** (*emphasis added*)

Concerning the semiconductor, Bernhard, David teaches the following:

The present invention relates generally to chemical formulations useful in **semiconductor** manufacturing and particularly to chemical formulations that are utilized to remove residue from **wafers** following a resist plasma ashing step. More specifically, the present invention relates to cleaning formulations for removal of inorganic residue from **semiconductor wafers** containing delicate copper interconnecting structures. (*emphasis added*)

Concerning the etch residues, Bernhard, David teaches the following:

In one aspect, the invention relates to a **method of removing** residue from a wafer following a resist plasma ashing step on such wafer, comprising contacting the wafer with a cleaning formulation, including (i) a fluoride source, (ii) at least one organic amine, (iii) a nitrogen-containing carboxylic acid or an imine, (iv) water, and optionally at least one metal chelating agent. (*emphasis added*)

Claims 26-50 rejected under 35 U.S.C. 102(e) as being anticipated by Vaartstra, Brian A. (US6666986).

Concerning the organic solvent, Vaartstra, Brian A. teaches the use of various solvents including supercritical solvents such as dimethyl carbonate, ethane, hexafluoroacetylacetone, etc. (see col. 5, lines 25-40).

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Concerning the quaternary ammonium fluoride, fluoride ion source and the ammonium hydrogen fluoride, Vaartstra, Brian A. teaches the following:

13. The composition of claim 11, wherein the selectivity enhancer is selected from the group consisting of tetramethyl ammonium hydroxide, **tetramethyl ammonium fluoride**, ammonium **fluoride**, and combinations thereof. (*emphasis added*)

Concerning the semiconductor, Vaartstra, Brian A. teaches the following:

Supercritical etching compositions and methods for using such compositions are disclosed herein. The following description is illustrative of various embodiments of the invention. It is to be understood that the term substrate, as used herein, includes a wide variety of **semiconductor**-based structures that can be etched or have inorganic layers therein that can be etched. A substrate can be a single layer of material, such as a silicon (Si) **wafer**. Substrate is also to be understood as including silicon-on-sapphire (SOS) technology, silicon-on-insulator (SOI) technology, doped and undoped **semiconductors**, epitaxial layers of silicon (Si) supported by a base **semiconductor**, as well as other **semiconductor**-based structures, including any number of layers as is well known to one skilled in the art. Furthermore, when reference is made to a substrate in the following description, previous process steps may have been utilized to form regions/junctions in a base **semiconductor** structure. It is also important to note that the substrate being etched can have a patterned mask layer thereon, such as, for example, a patterned resist layer, but it is not required. The following detailed description is, therefore, not to be taken in a limiting sense, and the scope of the present invention is defined by the appended claims. (*emphasis added*)

Concerning the etch residues, Vaartstra, Brian A. teaches the following:

Supercritical fluids have been used to **etch residue** from a variety of surfaces or extract substances from various materials. A gas is determined to be in a supercritical state (and is referred to as a supercritical fluid) when it is subjected to a combination of pressure and temperature so that its density approaches that of a liquid (i.e., the liquid and gas state coexist). Supercritical fluids have been used to clean contact lenses by **etching residue** from lense surfaces, as disclosed by Bawa et al. in PCT Application Publication Number WO 95/20476. Supercritical fluids, namely carbon dioxide (CO.sub.2), have also been used to remove exposed organic photoresist films, as disclosed by Nishikawa et al. in U.S. Pat. No. 4,944,837, to form a patterned photoresist film. As further disclosed in Nishikawa et al., once an underlying layer is patterned by conventional methods, supercritical fluids are used to remove the patterned resist film. (*emphasis added*)

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Claims 26-50 rejected under 35 U.S.C. 102(e) as being anticipated by Aoyama, Tetsuo (US6462005).

Concerning the organic solvent, Aoyama, Tetsuo teaches the following:

6. A cleaning agent as set forth in claim 3, wherein the **organic solvent** is selected from the group consisting of **dimethyl formamide**, dimethyl acetamide, formamide and N-methyl pyrrolidone as **amides**, {character pullout}-butyrolactone as a lactone, acetonitrile and benzonitrile as nitriles, **methanol**, **ethanol**, isopropanol and ethylene glycol as **alcohols**, and **methyl acetate**, **ethyl acetate**, and methyl benzoate as esters. (*emphasis added*)

Concerning the quaternary ammonium fluoride, fluoride ion source, ammonium hydrogen fluoride and the semiconductor, Aoyama, Tetsuo teaches the following:

As the fluoro compound in the cleaning agent for the **semiconductor** device according to the present invention there can be mentioned, for example, hydrofluoric acid, ammonium **fluoride**, ammonium hydrogen **fluoride**, ammonium borofluoride, **tetramethyl ammonium fluoride** and tetramethyl ammonium hydrogen **fluoride**. (*emphasis added*)

Concerning the etch residues, Aoyama, Tetsuo teaches the following:

As a method different from the **cleaning method** described above, there has been known a **method of removing** the residual resist after plasma ashing by using an alkaline aqueous solution such as a positive type resist developing solution containing tetramethyl ammonium hydroxide (Japanese Patent Laid-Open Sho 62-281332). However, a conductive layer made of an aluminum-containing substance is violently eroded with the alkaline aqueous solution in this method. (*emphasis added*)

Claims 26-50 rejected under 35 U.S.C. 102(e) as being anticipated by Fine, Stephen A. (US6280651).

Concerning the organic solvent, quaternary ammonium fluoride, fluoride ion source and the ammonium hydrogen fluoride, Fine, Stephen A. teaches the following:

Oxalic acid	2.5%
Tetramethylammonium <b>fluoride</b>	4.5%
Ethylene glycol	93%
Oxalic acid	1.3%
Pentamethyldiethylenetriammonium trifluoride	4.6%



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Ethylene glycol	94.1%
Oxalic acid	1.25%
Triethanolammonium fluoride	5%
Ethylene glycol	93.75%
Malonic acid	2.8%
Tetramethylammonium fluoride	5.1%
Ethylene glycol	92.1%
Iminodiacetic acid	2%
Ammonium fluoride	7%
Ethylene glycol	91%
Succinic acid	2.8%
Ammonium fluoride	5%
Ethylene Glycol	92.2%

*(emphasis added)*

Concerning the semiconductor, Fine, Stephen A. teaches the following:

Several different types of silicon oxide are utilized in the fabrication of **semiconductor** devices. Two of the most common types are referred to as "thermal oxide" and "BPSG." Thermal oxide is typically composed of pure silicon dioxide and is utilized when an insulating layer is required. For example, thin "gate" layers of thermal silicon oxide are often utilized to separate conducting layers from each other. Thermal oxide layers on **semiconductor wafers** are usually prepared by high temperature oxidation of surface silicon on a polysilicon **wafer**. BPSG layers are comprised of silicon oxide which has been doped with boron and phosphorus. These layers serve the purpose of "gettering" alkali metal ion contaminants which could otherwise migrate into underlying layers and adversely affect electrical properties of the layer materials, causing device reliability degradation. BPSG layers are typically created by deposition of a suitable precursor material via atmospheric chemical vapor deposition ("CVD") followed by thermal treatment to density and planarize the layer. PSG layers serve the same gettering functions as BPSG layers but lack boron. *(emphasis added)*

Claims 26-50 rejected under 35 U.S.C. 102(e) as being anticipated by Vaartstra, Brian A. (US6149828).

Concerning the solvent and the quaternary ammonium fluoride, Vaartstra, Brian A. teaches the following:

In a further embodiment of the invention, the supercritical etching composition can further include components, such as oxidizers (e.g., hydrogen peroxide

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(H.sub.2 O.sub.2), nitrogen trifluoride (NF.sub.3), ozone (O.sub.3), oxygen (O.sub.2), halogens (e.g., F.sub.2, Cl.sub.2, Br.sub.2, I.sub.2), sulfur dioxide (SO.sub.2), sulfur trioxide (SO.sub.3)), buffering agents (e.g., ammonium fluoride (NH.sub.4 F), **tetramethyl ammonium fluoride** (Me.sub.4 NF)), surfactants, selectivity enhancers (e.g., tetramethyl ammonium hydroxide (Me.sub.4 NOH), tetramethyl nitrogen fluoride (Me.sub.4 NF), and ammonium fluoride (NH.sub.4 F)), or ligands (e.g., **beta-diketones, fluorinated-diketones, organic acids, and the like**) to enhance the etching effectiveness. In particular, the addition of ligands promotes removal of metal from a substrate. The addition of ligands in the supercritical etching composition is particularly beneficial for etching HDC materials. These components, as well as many others, can be added to the supercritical etching composition. These components may or may not be in the supercritical state. Thus, they may be supercritical components or nonsupercritical components. (*emphasis added*)

Concerning the fluoride ion source and the ammonium hydrogen fluoride, Vaartstra, Brian A. teaches the following:

10. The method of claim 6 wherein the selectivity enhancer is selected from the group consisting of tetramethyl ammonium hydroxide, tetramethyl nitrogen **fluoride**, ammonium **fluoride**, and combinations thereof. (*emphasis added*)

Concerning the semiconductor, Vaartstra, Brian A. teaches the following:

Supercritical etching compositions and methods for using such compositions are disclosed herein. The following description is illustrative of various embodiments of the invention. It is to be understood that the term substrate, as used herein, includes a wide variety of **semiconductor**-based structures that can be etched or have inorganic layers therein that can be etched. A substrate can be a single layer of material, such as a silicon (Si) **wafer**. Substrate is also to be understood as including silicon-on-sapphire (SOS) technology, silicon-on-insulator (SOI) technology, doped and undoped **semiconductors**, epitaxial layers of silicon (Si) supported by a base **semiconductor**, as well as other **semiconductor**-based structures, including any number of layers as is well known to one skilled in the art. Furthermore, when reference is made to a substrate in the following description, previous process steps may have been utilized to form regions/junctions in a base **semiconductor** structure. It is also important to note that the substrate being etched can have a patterned mask layer thereon, such as, for example, a patterned resist layer, but it is not required. The following detailed description is, therefore, not to be taken in a limiting sense, and the scope of the present invention is defined by the appended claims. (*emphasis added*)

Concerning the etch residues, Vaartstra, Brian A. teaches the following:

Supercritical fluids have been used to **etch residue** from a variety of surfaces or extract substances from various materials. A gas is determined to be in a supercritical state (and is referred to as a supercritical fluid) when it is subjected to a combination of pressure and temperature so that its density approaches that of

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a liquid (i.e., the liquid and gas state coexist). Supercritical fluids have been used to clean contact lenses by **etching residue** from lense surfaces, as disclosed by Bawa et al. in PCT Application Publication Number WO 95/20476. Supercritical fluids, namely carbon dioxide (CO.sub.2), have also been used to remove exposed organic photoresist films, as disclosed by Nishikawa et al. in U.S. Pat. No. 4,944,837, to form a patterned photoresist film. As further disclosed in Nishikawa et al., once an underlying layer is patterned by conventional methods, supercritical fluids are used to remove the patterned resist film. (*emphasis added*)

Claims 26-50 rejected under 35 U.S.C. 102(e) as being anticipated by Honda, Kenji (US6030932).

Concerning the organic solvent and the 2-amino-2-ethoxy ethanol, Honda, Kenji teaches the following:

6. The composition of claim 3 wherein said amine is selected from the group consisting of: mono**ethanolamine**, di**ethanolamine**, tri**ethanolamine**, **diethylene glycolamine**, and N-hydroxyethylpiperazine. (*emphasis added*)

Concerning the quaternary ammonium fluoride, fluoride ion source and the ammonium hydrogen fluoride, Honda, Kenji teaches the following:

14. The composition of claim 12 wherein the fluorine-containing compound is selected from the group consisting of: hydrogen **fluoride**, perfluoric acid, ammonium **fluoride**, **tetramethylammonium fluoride**, ammonium **bifluoride**, ethylenediammonium **difluoride** and diethylenetriammonium **trifluoride**. (*emphasis added*)

Concerning the semiconductor, Honda, Kenji teaches the following:

In the manufacture of microcircuits, positive photoresists are used as an intermediate mask for transferring an original mask pattern of a reticule onto **wafer** substrates by means of a series of photolithography and plasma etching steps. One of the steps in the microcircuit manufacturing process is the removal of the patterned photoresist films from the substrates. In general, this step is affected by one of two methods. One method involves a wet stripping step in which the photoresist-covered substrate is brought into contact with a photoresist stripper solution that consists primarily of an organic solvent and an amine. However, stripper solutions cannot completely and reliably remove the photoresist films, especially if the photoresist films have been exposed to UV radiation and plasma treatments during fabrication. Some photoresist films become highly cross-linked by such treatments and are more difficult to dissolve in the stripper solution. In addition, the chemicals used in these conventional wet stripping methods are sometimes ineffective for removing inorganic residual materials formed during the plasma etching of metal or oxide layers with halogen-containing gases. (*emphasis added*)

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Concerning the etch residues, Honda, Kenji teaches the following:

A surfactant may also be optionally included in the cleaning composition so as to enhance the power of the plasma **etching residue** removal from the substrate. Suitable surfactants are selected from nonionic types, cationic types and anionic types of surfactants. Preferably, a surfactant is present in the composition of the invention in the range of about 0.1 ppm to 100 ppm by weight to a total weight of the cleaning composition. The cleaning composition may also, optionally, contain a minor amount of a corrosion inhibitor such as sugar alcohols, catechol and the like. (*emphasis added*)

Claims 26-50 rejected under 35 U.S.C. 102(e) as being anticipated by Jizaimaru, Takayuki (US5990060).

Concerning the organic solvent, Jizaimaru, Takayuki teaches the following:

Conventionally, when separating resist in production of semiconductors or liquid-crystal display units, generally sulfuric acid and hydrogen peroxide are mixed with each other in the state of respective raw liquids under a high temperature in a range from 100 to 150.degree. C. Or, in a case where the solution above has strong acidity and can not be used because of the bad effects over the substrate or other portions, an **organic solvent** with high concentration is used under a high temperature to remove the foreign materials as described above. Also in semiconductor production in recent years, a degree of integration to be realized has been becoming increasingly higher and higher, so that ion injection or reactive ion etching is required using photoresist as a mask, but in this type of processing a large quantity of ions is irradiated onto a surface of photoresist, and the photoresist material itself is bridged and cured, so that it is difficult to remove the foreign materials as described above only by means of wet cleaning in which a mixed solution of sulfuric acid and hydrogen peroxide or a high concentration **organic solvent** is used, and for this reason, after the cured photoresist section is burnt and removed by employing the plasma processing with oxygen plasma, and then remaining photoresist is removed with a chemical agent. (*emphasis added*)

Concerning the quaternary ammonium fluoride, fluoride ion source, ammonium hydrogen fluoride and the semiconductor, Jizaimaru, Takayuki teaches the following:

The processing time is a time required until no foreign material 6 is confirmed on a substrate with a scanning type of electronic microscope. In composition of the cleaning liquid shown in Table 2, KF indicates potassium **fluoride**, NaF indicates sodium **fluoride**, TMAF indicates **tetra-methyl ammonium fluoride**, H.sub.2 O.sub.2 indicates hydrogen peroxide, NE.sub.4 F indicates ammonium **fluoride**, O.sub.3 indicates ozone water, and H.sub.2 O indicates water. It should be noted that the initial surface roughness (RA) of the silicon **wafer 2** for **semiconductor** production shown in FIG. 7 is 0.12 nm. (*emphasis added*)

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Concerning the etch residues, Jizaimaru, Takayuki teaches the following:

Another aspect of the present invention is a **cleaning method** in which, by irradiating ultrasonic wave to a **cleaning method** prepared by mixing ammonium fluoride or alkali fluoride metal salt and an oxidizing agent in pure water, the cleaning liquid is supplied via a nozzle or the like to remove foreign materials deposited on a substrate. When this cleaning method is employed, countermeasures against temperature increase of the cleaning liquid due to irradiation of ultrasonic wave is not required, which makes it possible to reduce a size of a cleaning device. Also when this **cleaning method** is employed, it is preferable to rotate a substrate. When a substrate is rotated, a centrifugal force is generated and a velocity of the cleaning liquid is accelerated by the ultrasonic wave flowing on a surface of the rotating substrate, so that the effect for removing the foreign materials is further improved. (*emphasis added*)

Claims 26-50 rejected under 35 U.S.C. 102(e) as being anticipated by Aoyama, Tetsuo (US5962385).

Concerning the organic solvent, Aoyama, Tetsuo teaches the following:

Examples of the **organic solvent** soluble in water include **amides**, such as formamide, monomethylformamide, **dimethylformamide**, acetamide, methylacetamide, dimethylacetamide, and N-methylpyrrolidone; **ethers**, such as ethylene glycol monomethyl ether, diethylene glycol monomethyl ether, diethylene glycol monobutyl ether, diethylene glycol dimethyl ether, and diethylene glycol diethyl ether; **sulfones**, such as sulfolane; **sulfoxides**, such as dimethylsulfoxide; and **alcohols**, such as **methanol**, **ethanol**, isopropanol, ethylene glycol, and glycerol. Among these **organic solvents** soluble in water, **dimethylformamide**, dimethylacetamide, N-methylpyrrolidone, and dimethylsulfoxide are preferable. The organic solvent soluble in water can be used singly or as a combination of two or more solvents. The **organic solvent** soluble in water is used in such an amount that the concentration in the entire solution is in the range of 72 to 80% by weight, preferably in the range of 72 to 75% by weight. When the amount of the **organic solvent** soluble in water is less than 72% by weight in the entire solution, corrosion of wiring materials increases. When the amount exceeds 80% by weight, the ability to remove resist residues is inferior. (*emphasis added*)

Concerning the quaternary ammonium fluoride, fluoride ion source and the ammonium hydrogen fluoride, Aoyama, Tetsuo teaches the following:

13. A cleaning liquid according to claim 3, wherein the fluorine compound is selected from the group consisting of ammonium **fluoride**, a hydrogen **fluoride** salt of methylamine, a hydrogen fluorine salt of ethylamine, a hydrogen **fluoride** salt of propylamine, **tetramethylammonium fluoride** and **tetraethylammonium fluoride**. (*emphasis added*)

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Concerning the semiconductor, Aoyama, Tetsuo teaches the following:

The **semiconductor** device prepared above was dipped into a cleaning liquid for **semiconductor** device having a composition shown in Table 1 in the condition also shown in Table 1. After the dipping, the device was rinsed with ultra-pure water and dried. Removal of the resist residues on the sides and corrosion of the surface of the aluminum alloy were examined by observation using an electron microscope (SEM). The electric property of the **semiconductor** device after the rinse was measured in accordance with the following method of EBIC (Electron-Beam Induced Current): The surface of a **semiconductor** device was scanned by an electronic beam, and the electric current flowing through the device was two-dimensionally measured and displayed as an image to detect defects in a **wafer** (crystal). When defects were present, electromigration (disconnection) takes place, and the electric property deteriorates. Therefore, when defects were absent, the electric property was evaluated as good, and when defects were present, the electric property was evaluated as poor. The results are shown in Table 1.  
(*emphasis added*)

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregory E. Webb whose telephone number is 571-272-1325.

The examiner can normally be reached on 9:00-17:30 (m-f).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Douglass McGinty can be reached on (571)272-1029. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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A handwritten signature in black ink, appearing to read 'G Webb', with a stylized, cursive script.

Gregory E. Webb  
Primary Examiner  
Art Unit 1751

gew